Test of Discrete Event Systems - 08.10.2020

Exercise 1

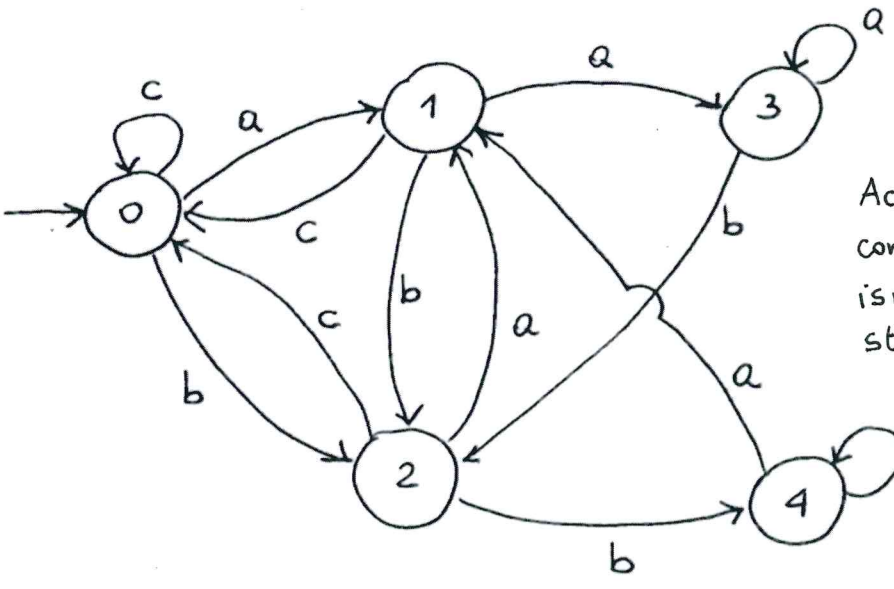
A machine performs operations of three types, denoted by a, b and c. For technical reasons, an operation of type c cannot be performed immediately after two consecutive operations both of type a, or both of type b. At initialization, no operation has been performed.

1. Model the logic of the machine.
2. Model a system designed to support the scheduling of the operations on the machine: given a sequence of operations, the system returns whether the sequence is feasible for the machine, or not.

1. events $\mathcal{E} = \{a, b, c\}$ — a: performed operation a; b: performed operation b; c: performed operation c

The definition of state for this system requires to take into account the last two operations performed:

$x =$
- 1: last operation "a", second last operation not "a"
- 2: " " "b", " " " " "b"
- 3: last two operations "a"
- 4: " " " "b"
- 0: otherwise



According to the technical constraint, operation c is not possible in states 3 and 4

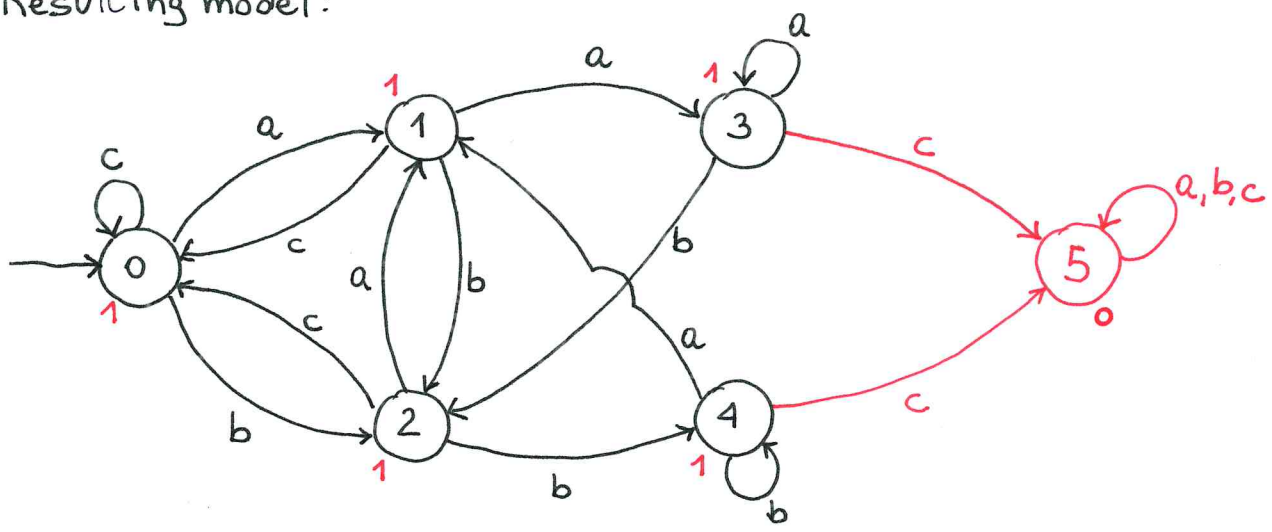
2. We add a dummy state collecting error situations (infeasible sequences of operations):

state 5 : error

We also define the following output:

$$y = \begin{cases} 0 & \text{if the sequence of operations is infeasible} \\ 1 & \text{otherwise} \end{cases}$$

Resulting model:



This model is useful for planning: given a sequence of operations, if the final output is 0, the sequence is infeasible, and feasible otherwise.

example: determine whether the sequence of operations

caabcbbcab

is feasible for the machine.

operation		c	a	a	b	c	b	b	c	a	b
state	0	0	1	3	2	0	2	4	5	5	5
output	1	1	1	1	1	1	1	1	0	0	0

the final output is 0:
the sequence is infeasible